POLICY facts

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OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Strategic Center for Natural Gas

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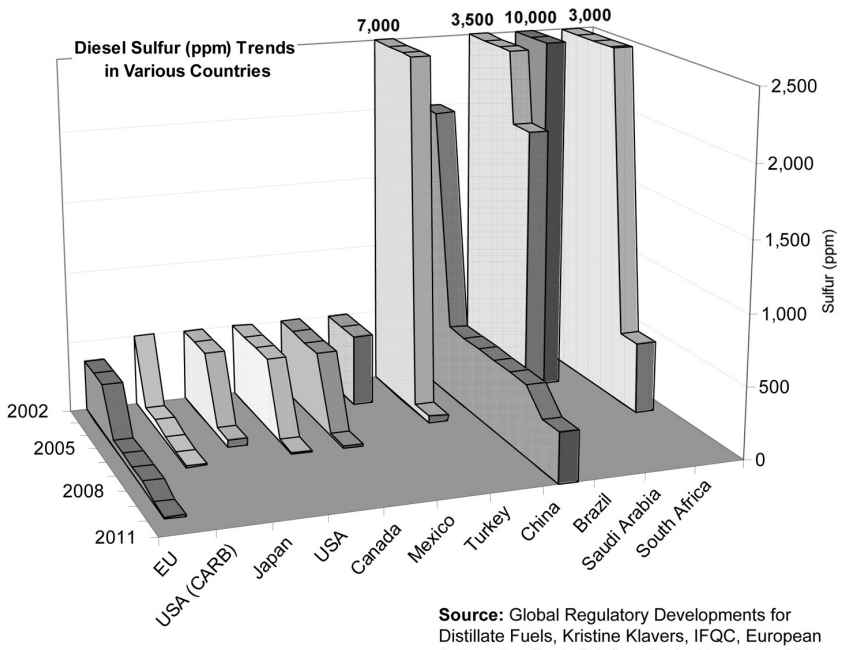
IMPACT OF EMERGING DIESEL REGULATIONS ON THE SECA PROGRAM

Current specifications for diesel fuel ensure compatibility with diesel engines and support current environmental protection regulations. The California Air Resources Board (CARB) regulations for diesel fuel are the most stringent in the nation, and diesel fuel used in CA actually exceeds specifications, especially for sulfur. The rest of the US and the world are following suit, with further reductions in sulfur levels in diesel fuel expected over the coming ten years. This is good news for fuel cells since sulfur poisons the anode and reforming catalysts.

Worldwide, further reductions in sulfur levels in diesel fuel are expected over the coming ten years.



Source: Global Regulatory Developments for Distillate Fuels, Kristine Klavers, IFQC, European Automotive Fuels Briefing, Paris, November 2002

Aromatics levels in diesel fuels are also increasingly under pressure, though proposed regulatory changes are less drastic then for sulfur. Aromatics lead to potential for soot and carbon formation throughout the fuel cell system. CARB has a 10/20% aromatics cap, but there is no federal aromatics regulation, nor is there one in the US 2007 emissions standards

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Impact of Emerging Diesel Regulations on the SECA Program

Background

For many of the potential applications of SOFC technology being developed under the NETL Solid State Energy Conversion Alliance (SECA), it is highly desirable that the technology can operate with diesel fuel. The transportation market is a large market for SECA fuel cells. Heavy duty trucks, limousines, and recreational vehicles could all use SECA fuel cell auxiliary power units (APUs) to provide power needs.

In SOFC, the use of diesel fuel represents two principal challenges compared to operating with lighter fuels such as gasoline, liquefied petroleum gas (LPG), or natural gas:

- The high sulfur levels allowed (between 150 and 500 ppm in the developed world, higher in developing countries) can lead to poisoning of the reforming catalysts or of the anode's electrocatalysts;
- The high content of aromatics and other compounds can lead to soot or carbon formation in the reformer, the fuel cell, or other parts of the system. This carbon eventually disrupts SOFC operation and can cause unacceptable emissions.

However, these same fuel properties lead to high emissions when used in the diesel engines we use today. To reduce engine emissions consistently with increasingly stringent environmental requirements, advanced aftertreatment technologies will be required, especially for the control of nitrogen oxides. Regulators in the U.S., Europe, Japan, and several other countries are gradually tightening fuel specifications for diesel fuel, limiting the amount of sulfur to 10 - 50 ppm. Such drastic improvements in diesel fuel quality can impact SOFC in several ways, including:

- Cleaner diesel will make it easier to make SOFC technology compatible with diesel fuel. This could have implications for the SECA research and development program as well as for the timing of market introduction of diesel-powered SOFC;
- Cleaner diesel and the accompanying emissions control technology will dramatically reduce the emissions from conventional diesel engines and increase their cost, which may impact the competitive position of SOFC.
- Idling restrictions and other diesel engine use regulations may also impact SOFC competitive positioning, generally favoring the quiet SOFC.

Study Description

To further understand these diesel regulations and their impacts on the SECA fuel cell program, NETL has commissioned a study to:

- Characterize the relevant diesel specifications and related regulations with respect to their timing and effect on diesel fuel and its uses.
- Evaluate the effects on the SECA fuel cell technology targets, timing, and likelihood of success.
- Evaluate the effects on the market applications and benefits of the SECA fuel cell, considering the impact on both SOFC and conventional diesel engine technologies.

The study will consider diesel fuel utilization in all relevant SECA technology applications, including:

- APUs for automobiles, trucks, commercial maintenance vehicles, and recreational vechicles;
- Telecommunications and other "remote" industrial applications;
- Military applications, including vehicle APUs and mobile power;
- Non-road vehicles;
- Mobile generators.